

Managing and Motivating Staff to Save Energy



ARCHIVED DOCUMENT **ENERGY EFFICIENCY**

**BEST PRACTICE
PROGRAMME**

MANAGING AND MOTIVATING STAFF TO SAVE ENERGY

This booklet is No. 84 in the Good Practice Guide Series and it aims to show the important part that people play in managing energy. It emphasises that energy is a management issue and offers guidance on how to start an energy saving campaign, with particular advice on how to motivate staff to save energy. Some case histories are included to show how other companies have managed their campaigns, to provide both suggestions and encouragement.

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FOREWORD

This Guide is part of a series produced by the Department of the Environment, Transport and the Regions under the Energy Efficiency Best Practice Programme. The aim of the programme is to advance and spread good practice in energy efficiency by providing independent, authoritative advice and information on good energy efficiency practices. Best Practice is a collaborative programme targeted towards energy users and decision makers in industry, the commercial and public sectors, and building sectors including housing. It comprises four inter-related elements identified by colour-coded strips for easy reference:

- *Energy Consumption Guides:* (blue) energy consumption data to enable users to establish their relative energy efficiency performance;
- *Good Practice Guides:* (red) and *Case Studies:* (mustard) independent information on proven energy-saving measures and techniques and what they are achieving;
- *New Practice projects:* (light green) independent monitoring of new energy efficiency measures which do not yet enjoy a wide market;
- *Future Practice R&D support:* (purple) help to develop tomorrow's energy efficiency good practice measures.

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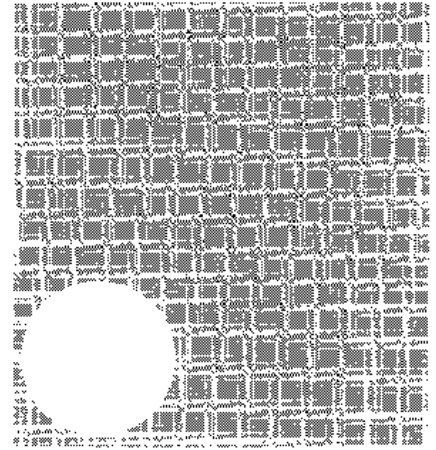
PREFACE

This guide has been written in the belief that you will manage energy more efficiently if you can look forward happily to the tasks than if you find them a chore.

We hope this book will keep you awake and convey the sense of enjoyment and satisfaction which we have experienced during the many years we have spent motivating management and work-forces to look for energy waste and stamp it out.

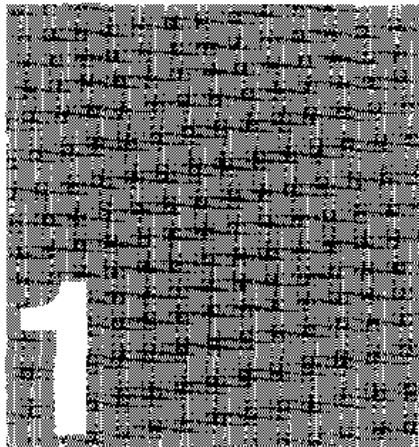
This guide is aimed at the full-time and part-time energy manager of an organisation or the departmental manager whose task it is to reduce the cost of energy consumption. It will also be useful for senior and financial managers who need to position energy costs in the context of other high expenditure items.

Energy management has been written about in detail in many other books but an engineering and technical approach has invariably been taken. This guide concentrates on the part which **people** should play in reducing costs. However, several aspects of energy management have been included as background information, because they are relevant and a balanced picture would not be given without them. One example of this is monitoring. People are motivated by success - if energy consumption cannot be measured, energy savings cannot be assessed.



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INTRODUCTION

Until now people have been largely ignored in energy efficiency. Experts have demanded more and more technology. Yet properly harnessed, the human beings who are guilty of so much waste will rally to help you stamp it out. You have to persuade management and staff to become *personally involved* with the problem. You need their emotions to work for you as well as their minds. You must encourage fire in the belly, not cold in the head. And don't forget that while you can hire brains and brawn, hearts need to be won.

So, faced with the problem of motivating people to save energy you have three options:

- sit tight and do nothing;
- try and pass the problem on to a colleague;
- take this guide home and read it in bed.

It is strongly recommended that you take the third option. The best reason of all for reading this guide is that unless you learn how to motivate people, your organisation will continue to waste energy however good the technology is that you use. People will only support you if you learn how to:

People are always willing to help if they feel that their help is both wanted and appreciated.

- encourage them;
- make them feel needed and important;
- allow them to excel;
- admire them;
- understand that they want to be proud of their work, skills and achievements;
- assist them to enjoy their jobs instead of being bored;
- offer them a more interesting life;
- make sure they are kept informed on how their ideas and help have been useful, and think of ways of rewarding them.

This support can usually be enhanced by bringing teamwork to bear. People enjoy working together - this increases the level of motivation all round and improves their joint output.

Energy saving is not an exciting and interesting cause for most people. This book will tell you how you can make it just that.

Why is Energy Wasted?

There are so many reasons why energy waste abounds in business and they should not be forgotten. Amongst the top five reasons given are usually:

1. *It's not my job to save energy.*
2. *I'm too busy to do anything.*
3. *It's always available when I need it.*
4. *I don't have to pay the bills.*
5. *Top Management doesn't care. Why should I?*

The list could easily be much longer and you'll doubtless be able to think of other reasons why waste occurs.

Energy Saving Needs Good Management

To save energy you need to get people's support, both singly and in groups, and this requires good management. It also requires leadership.

To manage other people you need to be able to manage yourself. This means that you have to learn to be in the 'A Category'. To develop a network of supporters for your energy efficiency programmes, you must boost morale by being:



It is no use trying to save energy without the support of your staff.

Or you must at least *attempt* to be most of these. Unless you learn to like and sympathise with the people you seek to motivate, they won't want to co-operate with you.

- ✓ Set an example.
- ✓ Set high goals.
- ✓ Be available when people need help.
- ✓ Communicate in clear and interesting language.
- ✓ Praise others whenever you can instead of seeking praise yourself.

Most people aren't interested in energy but they are interested in themselves. So discover what makes them tick and harness their needs and ambitions to your energy bandwagon.

At a recent Energy Efficiency Office (EEO) energy management seminar, three separate syndicate groups of managers asked how to gain people's support at the first meeting with them. The answer, which they all accepted, was this:

- Show them you believe in yourself and in them.
- Make the meeting fun and break the ice.
- Obtain and present information they can get their teeth into and which they can see is promising.

British Rail train drivers were inspired to use a technique called 'Coasting' to reduce electricity consumption when they realised that some of the money saved would be used to take handicapped children out on steam train excursions.

A Chief Executive who had always been far too busy to concern himself with energy saving, developed a real interest when he was asked to provide an enthusiastic introduction to a video on the subject.

- Find out what motivates each person and try to satisfy their personal needs.
- If there is silence after you ask a question, sit it out until somebody answers - never break it yourself.

It's quite wrong to think that motivating people to save energy is too difficult. It's a challenge and an opportunity - ***you can succeed and you can achieve worthwhile, long-term results.***

A Management Issue

Even moderate energy management can lead to substantial savings for negligible cost.

Good management is as central to achieving energy efficiency as it is to managing the whole organisation effectively and profitably. There is no secret about energy or management and good results can be achieved by adopting a common-sense approach and proceeding accordingly. Invariably there are substantial savings waiting to be made - usually 5% of the total consumption and often very much more.

In most organisations people's jobs and responsibilities will follow similar patterns, as will their loyalties. The company structure of management, normally consisting of central and departmental management though it may have more tiers, can be applied to energy management. Energy consumption, including central services, should follow the same structure both for accountability and for costs.

Merely asking questions about energy consumption or patterns of use has a strong motivating effect. When people realise that someone is paying attention, they respond. This alone can reduce consumption by 3 - 5% - if you don't believe this, try it for yourself!

The energy manager of an organisation has an overall remit for securing energy savings, centrally and departmentally, whether through technical change or good housekeeping. As with management generally, he needs to know what's going on. It's no different from your bank account - you need to check your bank statements regularly or your finances get out of control.

The energy manager and the department managers should hold energy budgets covering all energy cost headings such as electricity, gas, oil, water and effluent, steam, compressed air and hydraulics. To achieve this, regular monitoring will be required at all interfaces: supplier/ company (central) and central/departmental. This will give all managers a good idea of what energy they are using and why, and will also show the results of their energy saving measures. Monitoring sharpens the mind as well. It is important to record production volumes, weather conditions and other outside factors, too, as these will have an effect on energy usage.

For every significant energy consuming centre there should be a simple index of performance which fully reflects consumption on a comparable basis. For example, energy consumed per square foot in a factory building, warehouse or office is an effective index for both the initial assessment and subsequent regular monitoring if you intend to drive down the consumption.

There is usually a set of management ratios which act as benchmarks for organisations in industry producing the same goods. Many of these ratios link money, volume and people, but there are some relating directly to energy such as energy consumption per volume output, energy costs/non-paybill costs and so on.

Experience has shown that monitoring on a weekly basis is effective but a longer interval, such as monthly, tends to be too infrequent and you run the risk that your results will fall into disrepute. Where people are closely involved, especially where teams are in competition, weekly results are essential to keep up the impetus.

There is often a widespread feeling that energy savings can only be achieved by spending money. This is not strictly true and needs to be put into perspective.

During a campaign the energy manager, the line departments and people supporting the campaign, individually or in teams, compile an ever-increasing list of actions to be taken. The measure of the campaign's success will be related to the rate and number of those actions being implemented. Actions fall into three broad areas:

A big door left open in winter can add up to £4,000 to the heating bill.

Each 40W light costs upwards of £25 if left on for a year.

- good housekeeping practices;
- jobs which can be undertaken during production and/or maintenance periods;
- projects requiring design work and proposal preparation and approval, usually by competitive tender by outside contractors.

The development of good housekeeping practices should be boosted through an energy newsheet or by promotional events. In most companies there are already budgets which can be tapped to support these inexpensive activities.

Energy-saving work in the factory can usually be fitted into current defect lists and carried out in the course of other work at only nominal cost. However, there are pressures and priorities which can push this work back. The energy saving lobby therefore needs to be alert, active and prepared to fight its own corner. Typical energy-saving actions in this area are stopping leaks, repairing doors and windows, fitting time and temperature controls to lighting and ventilation equipment, and isolating plant so that it does not have to be run all the time.

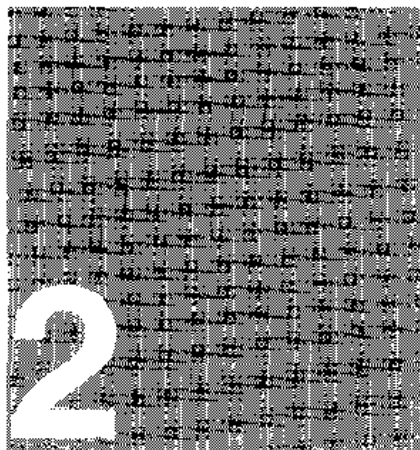
With projects it is important to work up the basic proposal, especially the justification and payback areas, before handing it over to the appropriate department for processing. Even then you need to keep track of it and nurse it through to implementation. Normally a proposal with a one- or two-year payback will stand on its own feet.

In many companies, if you succeed in making worthwhile energy savings through good housekeeping and minor items, it will help you to push through the larger projects. The cleverest people are those who use the savings from no-cost and low-cost opportunities to finance high-cost opportunities at a later date.

Occasionally people are overawed by the sheer complexity of their energy situation. This may be greatly eased by following our old friend Pareto who said that 20% of the effort will lead to 80% of the action. Frequently 20% of the buildings or process areas consume 80% of the energy. If this is the case within your organisation it is more obvious where you should start.

Timer controls to prevent excess operation usually pay for themselves within a few days.

A departmental manager applied Pareto's advice to all his costs and was surprised to discover that his electricity bill was double his labour bill. Immediately he adjusted his priorities and reduced the monthly energy bill from £51,000 to £37,000 - an annual saving of £168,000. Marvellous! And all this pure profit for briefly looking at the subject.



KEY ASPECTS OF ENERGY MANAGEMENT BY MOTIVATION

The People Aspect

Before you start reading this brief section on management by motivation - relax! There is no need for you to struggle through a thicket of jargon and theoretical psychology.

So, instead of textbook theory, let's start with seven well-tested principles of motivation which have emerged from successful managers' down-to-earth experience.

Motivation (and thus willingness to co-operate wholeheartedly with management) tends to increase:

- as people are given the opportunity of personal involvement in the making of decisions about actions that will affect them;
- as people are properly informed about realities, problems and reasons for decisions;
- as people are given authority to decide on the most effective way in which to carry out their own work;
- as people are given recognition for their personal contribution;
- as people believe that you, as their manager, are genuinely interested in them as individuals;
- as people are given incentive rewards (in addition to their regular remuneration) for exceptional efforts - not only of material value but also of emotional value to them;
- as people also understand the consequences to them of failure.

Management is more than planning and administering. ***Management is effective interaction with human beings.***

The Management Aspect

If you want to do more than just pay lip-service to the seven principles of motivation and really want to get the best out of people, you will have to become more aware of your management style.

Try not to get starry-eyed about it. A more responsive management style cannot be undertaken casually. If it is to be adopted with serious intent, a number of important considerations have to be thought through first.

- Your interaction with other people (and other target groups) must never degenerate into abdication of your managerial responsibility. Everybody involved must understand the manager's essential right and duty to make

the final decision once interactive consultation has run its course. This type of understanding requires a genuine dialogue right from the start.

- Participatory interaction with human beings must never degenerate into pretence or sly manipulation. Openness is essential. Once you, the manager, have made up your mind, you should say so and explain your reasons.
- Not all recommendations by staff can be implemented automatically and indiscriminately, but having encouraged as many ideas and suggestions as possible, you must say 'thank you' for every one of them. Every suggestion merits a reply within 10 working days, containing either an acceptance or a reasoned answer explaining why it cannot be implemented. If you adopt this courteous and efficient approach it will encourage people to submit their ideas. Having invited and received ideas and then having arrived at a decision, you should call together all those involved, announce your decision and your reasoning behind it. You should then encourage further brief discussion, in order to help those who may be disappointed by the decision to talk out their doubts.
- When announcing your decision be sure to mention by name the individuals whose ideas were incorporated. Even if you had the same idea yourself, and possibly first, you will gain more if you are unselfish with the credit.
- Once action is to be taken, allow people as much freedom as possible in deciding how they will put it into effect. People must 'own' the decision (which can be almost as effective as financial co-ownership). They must perceive the decision and the effort as 'their own baby'.



The Energy Management Aspect

The principles of motivation mentioned are of particular importance to energy management and to the never-ending struggle with energy waste problems.

Staff and users must share in the ownership of energy waste problems - no amount of monitoring and measurement and no amount of investment in technology can do the job unaided and untouched by human hand.

When considering energy management most people tend to think of **MANAGEMENT INFORMATION** first (data, monitoring, measurement, analysis and decision making), followed by **PHYSICAL INVESTMENT** (technology equipment) which is a major essential as well as being the major cost item of energy management.

Unfortunately, however sophisticated the equipment and however exact the information, unless *people* are persuaded to change their entire attitude towards the way they use and think about energy, vast areas of day-to-day waste will still remain. Machinery and processes will be operated without concern about energy conservation. Optimisers will be by-passed, meters incorrectly read, lights left on, taps left running, and doors and windows left open.

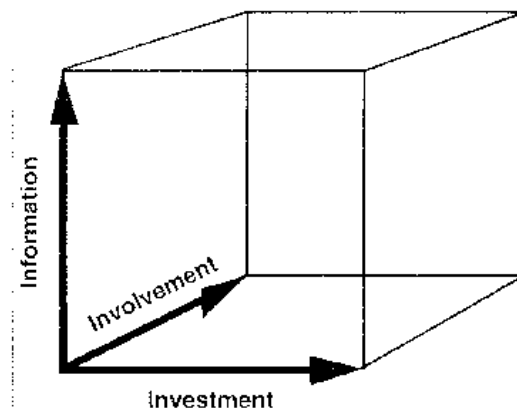
Information remains inert data unless it is processed and acted upon by human beings. Investment remains lifeless hardware unless it is utilised intelligently and conscientiously by the software of the human mind. That's why for effective energy management (like all other functions of resource management) life has to be infused into information and investment by adding the third dimension: **HUMAN INVOLVEMENT**.

Demotivating and Motivating Aspects

Resources, including energy, may be costs occupying the minds of managers, but they are certainly not at the front of most people's minds, especially those of employees. There are three main reasons for this:

- 1 Most people and especially employees tend to concentrate on the job in hand rather than on the means or facilities used. Energy is a particularly 'invisible' facility and it is taken for granted.

A Structured approach needs:



- 2 Most people and especially employees may occasionally think about energy, but the day-in, day-out use of energy is repetitive, subconscious and rather boring: a monotonous routine.
- 3 Most people and especially employees do not view energy costs in the same way in the work place as they do in their own homes, because the costs are not directly paid by them.

If these reasons can be classed as 'demotivating' factors, there is nowadays a relatively new 'motivating' factor: environmental concern. There is an increasing awareness of energy as a diminishing resource, costing more and more money, and a greater knowledge of the potential ecological damage which can result through its generation and use in many cases.

All four of these factors provide a real challenge to management. How do you overcome disinterest and boredom and at the same time build on growing environmental concerns?

Managers, and energy managers in particular, need to be able to create - and keep alive - true awareness of resource value and of the need to avoid unnecessary waste. This skill does not just mean issuing unilateral instructions. It means interactive dialogue, i.e. two-way communication.

Two way communication does not only:

- exhort it also asks people;
- impose it also obtains agreement on targets;
- measure data it also elicits feedback;
- instruct it also motivates by incentives;
- maintain equipment it also maintains people.

The Communicative Aspect

Communication is a never-ending task. You will not get very far, nor will you have much of an enduring influence, if you only instruct or exhort people, or if you just tell them what to do without asking for their own personal input.

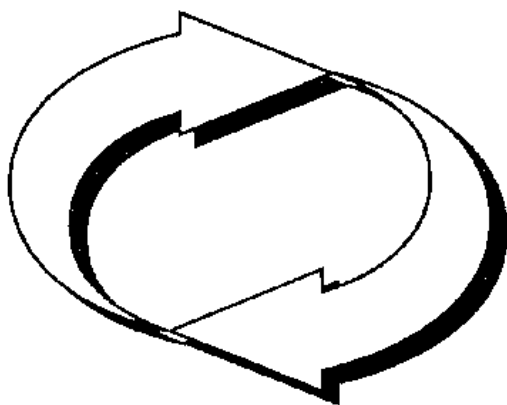
You will not achieve much by announcing and imposing energy consumption targets, or by laying down routine duties. You can only evolve and truly establish energy consumption targets and working procedures by asking all those involved to help in formulating, agreeing and implementing tasks.

Your monitoring and interacting will not be of much use if you only ask for feedback of measured data in the form of reporting duties. You must elicit conscious, articulate feedback by regular human stimulation. Such stimulation can only work by constantly asking people for their views, suggestions and - yes - criticisms. This stimulation needs to be supported by incentive rewards for achieving agreed performance targets and for exceptional personal contributions. These incentive rewards do not necessarily have to be monetary or physical - they should frequently take the form of 'quality of life' values.

Physical equipment must be maintained - but so must people. So, in practice, at least three forms of encouragement and stimulation are needed: ASK, AGREE, GIVE.

- | | |
|--------------|---|
| ASK | people what they know, think and suggest in relation to energy waste.
people how they think they could individually contribute to the reduction of that waste. |
| AGREE | objectives, targets and monitoring duties.
incentives and rewards. |
| GIVE | incentives and rewards.
feedback on results.
<i>thanks.</i> |

Two-way Communication



When three British Rail Depot workers discovered overcharging by an energy supplier and secured a refund of £25,000, their achievement was immediately recognised by Management. A private luncheon was held for their families and themselves, when tributes were given and cheques presented.

Only through such a responsive attitude can the function of energy management be lifted from a narrow engineering/administerial approach onto a higher plane of true resource and people's management.

The Creative Aspect

Although you will benefit from understanding the principles of motivation, the need for genuine two-way communication and the problems of making the repetitive routine of energy saving less boring, you will need more than a general understanding if you want to develop, implement and maintain really effective motivation programmes. You'll need specific ideas.

You will need imagination to take inspired initiatives and to inject stimulating ideas into energy management programmes.

Unless you succeed in making wastewatching interesting, so that people discover 'wastewatching is fun', you will not motivate anybody.

Ideas applicable to specific organisations and situations cannot be produced in the abstract.

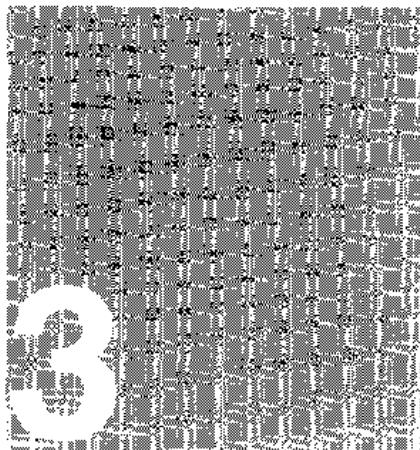
- Each organisation and each situation is unique.
- Each group of employees and users reacts differently to managerial initiatives.
- Each group can be 'turned on' by ideas and incentives, but in each case the ideas and incentives will have to be different. They will have to be evolved from specific environments, problems and situations.

Many examples from industry have shown a common theme: using a percentage of savings achieved over a given time-span to fund incentive rewards with an intellectually and emotionally relevant meaning. The incentive is even greater when staff are able to select how the money is spent. Such motivation programmes can only be kept up over longer time-spans if the specific incentive rewards are replaced by new and equally exciting ones, before they become boring by routine repetition.

Both the specific ideas and the changing rhythm of motivation programmes require a constant flow of fresh initiatives, i.e. true creativity on your part and on the part of specialist motivation consultants if you decide to use them.

A train driver can save up to £7,000 per year in electricity by learning how to 'coast', i.e. how to switch off electricity input whenever the train can proceed by idling (before slowing down to stop or before needing new power input). To 'coast' consistently, however, requires concentration and driving skills. A driver's commitment can only be maintained if he is aware of true benefits, such as pride in his skill and performance, and satisfaction in working efficiently and in contributing to a cleaner environment. Yet for really outstanding results, you need to add more tangible and personal benefits in the form of monetary and emotional incentives. When BR offered to take drivers' handicapped children on steam train excursions paid for out of coasting savings, there was a greater interest and co-operation in saving energy than ever before.

Employees in a large factory were encouraged to watch energy use more closely when it was proposed that part of any monetary savings they achieved would be used to pay for students from Central and Eastern Europe to visit Britain and study modern techniques.



BARRIERS AND HOW TO OVERCOME THEM

There are many perceived barriers to managing energy. Some of these barriers could be expressed as:

- ignorance;
- fear;
- mundaneness of the subject;
- latent desires to preserve the *status quo*;
- long time-scales to achieve results;
- and about a hundred and one other excuses.

In practice all of these barriers can be by-passed or dismantled completely.

Knowledge of Energy Cost and Consumption

Past decades of cheap energy, coupled with abundant supplies and delegation of the supply responsibility to the Works' engineering function, have created an environment in which energy is always there irrespective of cost. Indeed, interruption of energy supply creates far more emotion than an increase in price.

ESTABLISHING THE ENERGY COSTS IS ONE OF THE FIRST, AND USUALLY THE MOST EMBARRASSING, ESSENTIAL ACTIONS.

Find out what your organisation paid for each fuel type for each of the last twenty-four months. This is bound to raise questions regarding consumption fluctuations, and the total consumption, when known, is invariably higher than most imagined.

Regular monitoring of consumption should lead to savings of up to 5%, often more. Until energy use is noted it won't be noticed. Monitoring is the only way to get consumption under control.

Relevance

The bill may be high, but it may still be only a small percentage of the cost of sales. This fact frequently misguides people because, unlike many items, energy is a **CONTROLLABLE COMMODITY**. There are many industrial processes where **ENERGY IS ONLY 3%/4%/5% OF THE COST OF SALES BUT 25%/30%/35% OF THE CONTROLLABLE COSTS**. Does it, therefore, receive its fair share of management time? Frequently small reductions in controllable costs **PRODUCE PURE PROFIT EQUIVALENT TO SIZEABLE ADDITIONAL OUTPUT OR SALES**.

Management Matters

Energy is frequently not considered a management issue. Why not? It should be - just as attention is paid to material yield, to labour costs, to productivity and other production costs, it should be paid to energy costs.

ENERGY IS EASY TO CONSIDER. TRY IT.

Board Level Support

A frequent excuse given by management is that the Board are not interested or don't show an interest. Whether or not that is true, why have we always got to wait for the Board? Some of the best results have been achieved first and notified up the line later. **THAT'S INITIATIVE and very much BETTER THAN BEING ON THE RECEIVING END OF A DIRECTIVE.** In most organisations Directors welcome initiatives and thereafter support them more readily.

Comparisons

Comparisons of performance are crucially important in this increasingly competitive world. They are required to help maintain existing performance, improve upon it and make sure that competitors are not creeping ahead in the drive to eliminate unnecessary cost.

The easiest way to gauge performance is through calculation of an energy index. In its simplest form, the energy index should be the energy you buy divided by the output you achieve from it, preferably expressed in energy units.

ENERGY PER TONNE OF OUTPUT or ENERGY PER SQUARE METRE OF FLOOR AREA are two of the simplest and most revealing indices to calculate. Plot them weekly or monthly and ask for reasons for any fluctuations. Some organisations have saved up to 32% of their consumption by doing no more than this.

The approach is simple, does not involve establishing a target in advance and is readily refined, extended and sub-divided later. If the index varies for no apparent reason, the potential benefits of continual monitoring will be far greater.

'We have No Money'

'We have no money' is another frequent argument for ignoring energy, but capital up front is not necessarily required. Of course it helps, but some of the best energy programmes have begun by addressing the no capital cost opportunities first, the low cost next and the high cost last. In this way the benefits of the no cost and low cost can be used to finance subsequent high cost investments, enabling a comprehensive energy programme to be established for zero additional funding. Many of the most successful organisations proceed this way as a matter of course.

Awareness of Opportunities

Another barrier to energy management is 'We don't know what we can do'. This may be true in the short term, but there is much that can be done to find out the real opportunities.

One way is to hire an expert to identify and quantify the opportunities, although this will obviously incur capital expenditure. Alternatively, for no cost you could ask: 'What would we do if oil, gas and electricity were to be rationed?'; 'How much could we save in a crisis?'; 'What would we need to change to save even more?' and so on. The answers to questions such as these are always very revealing and invariably they throw up opportunities in the no cost and low cost categories, capable of rapid implementation.

Technical Jargon

Energy is a straightforward, common-sense subject. As such, it is best understood in conventional English, and everyone trying to manage energy should use straightforward terms to explain it. For example, we buy electricity in 'units' or kilowatt hours in our homes, so why select any other unit when discussing it? Similarly, when describing processes, the descriptions should be kept simple, using analogies where applicable to get the meaning across.

Two of the UK's most successful energy managers have degrees in English and accountancy respectively. Their success is undoubtedly helped by being able to talk about the subject in plain English, making it virtually impossible not to understand what they are saying.

In an aluminium foundry, the Production Director placed a board outside the canteen door and wrote on it: "Last week we used 74 gallons of oil per tonne of aluminium. Our target is 49." Within three months the target had been achieved, a saving of 34%. And further savings are still being made.



The Mundane Subject

Yes, energy can become mundane especially if treated as a dull technical aspect of industrial and commercial life *but it can also be made to come to life.*

Steam leaks cost about £250 each year per foot height of plume.

The surplus steam capacity available in a new large hospital was once described as being sufficient to manufacture a quarter of the United Kingdom's annual demand for lavatory paper. Everybody from the Chief Medical Officer downwards understood the analogy, and immediately wished to improve their energy situation.

In a white goods assembly plant the energy consumption was described as being more than sufficient to produce the same weight of liquid steel as white goods. Again, a superb reaction occurred. The Managing Director and Board immediately gave top priority to addressing energy, and today the consumption per unit of output has more than halved.

Fitting individual controls to each light fitting is a low cost operation which usually pays for itself in three months.

Time Scales to See Results

It is true that it generally takes a long time before major investments in new plant and equipment designed to save energy generally starts to show results. To get demonstrable results at an early date, start by ruling out any major investment and give your full attention to the no and low capital cost items which will give you a much quicker payback.

The Status Quo

Oh dear! Why is there so much effort to preserve the *status quo*? We expect our salaries to change, so why not our products, systems, procedures, energy sources and methodologies of energy usage.

Centralised steam systems were essential when coal was the only available fuel. Nowadays, gas is the dominant fuel, with oil almost as popular. These fuels deserve decentralisation and offer replacement of steam with cheaper, direct firing, and can be used to provide just hot water where required. Even so, in some organisations pressure to retain the costly steam systems can remain as a sacred cow - there will rarely be other reasons.

In general, today's popular fuels are more versatile and exciting to deal with, because more can be achieved for less fuel. If in doubt, simply work out the fuel requirement for each fuel on both a centralised and a decentralised system, and then develop the optimum approach for yourself. **HUGE SAVINGS REMAIN TO BE ACHIEVED BY CHALLENGING THE STATUS QUO.**

Pursuit of Technological Solutions

It is a fact that technologically-orientated minds wish to pursue technological solutions as a first choice. This can prove to be like a Doctor specifying an operation for a headache. At worst it can hold up the overall energy programme because the time scales involved are longer, and is frequently delayed because of the cost.

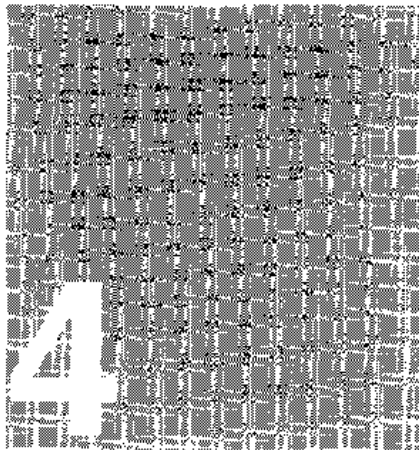
If a technological solution is put forward as part of a comprehensive programme it is much more likely to succeed, because it will indicate, particularly to financiers, a more competent situation, and the specific financial requirement also is likely to be less.



A factory with four boilers wanted converting to accommodate a second fuel. Originally the factory planned to equip all four boilers with relatively expensive dual-fuel burners, as the maximum heat demand required three boilers to be on-line at the same time. However, a little attention to energy efficiency reduced the maximum demand such that it could be supplied by only two boilers.

As a result, total flexibility was obtained by converting two of the boilers to a different fuel - half the number originally proposed. Additional money was saved because the conversion did not involve combined dual-fuel arrangements. The conversion cost turned out to be just 35% of that envisaged and, thanks to the energy efficiency measures, the annual energy costs have been reduced by 24%.

Every extra 1% of surplus air in a boiler increases fuel consumption by 3% upwards.



HOW TO MAKE IT HAPPEN

This section covers the key issues that tend to apply in all situations to varying extents, irrespective of the size or type of process or organisation. It is important that they are all addressed as part of any energy management programme. Do not forget that **ENERGY IS A MANAGEMENT OPPORTUNITY. ENERGY MANAGEMENT REPRESENTS YOUR BEST, CHEAPEST AND MOST ACCESSIBLE ENERGY SOURCE.**

Who Owns the Energy Opportunity?

Opportunities do not get harnessed and problems do not get solved until somebody specifically 'owns' the problem. With energy, ownership is often overlooked, possibly because in many organisations responsibility for energy tends to cut across other lines of authority, or it may be a hangover from when energy was relatively cheap and there was no need to identify such responsibilities.

It is, therefore, necessary to identify:

- the significant responsibilities in your own particular situation;
- how these responsibilities can be clarified within the limits of your existing organisation;
- what information is necessary to support such responsibilities and to assist users to achieve results in terms of reduced energy costs.

It is reasonable to expect at least a 5% reduction in energy usage through allocating ownership of energy problems - savings as high as 8% of the current expenditure on energy have been achieved at some sites.

Somebody must own every problem. Their role can be either catalytic or direct line authority, or a mixture of roles. It needs to be spelt out. Energy problems are rarely solved until all users become responsible for their own part of them.

Establishing cost and consumption figures

Imagine what would happen if you never received a bank statement. Energy is no different. Without the necessary figures it can get out of control and you won't know where to start in managing it. You must find out what your energy costs are and how much energy is consumed. Whoever pays the bills is likely to know. The accountant usually has the information and, because energy involves money, will generally be supportive of any energy saving campaign.

Once you have cost and/or consumption data, you still have a great deal to discover, including its overall significance, relevance, variability and other interesting facts and figures. **YOU NEED TO RECEIVE AND ANALYSE ENERGY DATA ON A REGULAR BASIS.** Start with the cost figures and try to allocate them to the individual departments, if possible duplicating the underlying management structure - don't forget *energy is a management issue.*

Electric meters may be expensive to install, but useful information can be obtained by using an hours-run meter costing £25 installed.

Determine a Simple Index of Performance

The performance index is the part that begins to hurt and to inflict pain. It is also the part that begins to increase alertness, helps to ensure people give you their attention, enables you to talk objectively and promotes further discussion. The index of performance should be relevant to the industry or process, and it must somehow reflect energy consumed per unit of output or equivalent.

Food, paper, chemicals, textiles, ceramics and all other energy intensive industries all need indices of energy performance to enable comparison of usage with design or industry standard figures.

Monitoring

Monitoring of the performance index is absolutely crucial. It is the equivalent of recording the mpg of your car. Generally, when adequate monitoring systems are introduced, energy is brought to the people's attention and its use is rapidly brought under control. Through monitoring alone, savings of anything from 5% upwards can result. **MONITORING DOES MORE TO REDUCE ENERGY USAGE THAN ANY OTHER SINGLE STEP.**

In addition to reinforcing the energy management programme, a suitably designed and simple energy monitoring system enables:

- the effects of any conservation measures to be monitored and evaluated;
- tighter management control and accountability over energy costs and usage;
- equipment deficiencies to be highlighted at an early stage, letting technical support staff to take corrective action much sooner;
- managers who are genuinely interested in energy to take a far greater interest in the subject;
- the whole subject of energy to be objectively discussed at every level of the organisation;
- previously uninterested individuals to be made aware of what's happening and to develop an interest for themselves.

MONITORING IS POWERFUL.

Good Practice 'Norms'

Frequently good practice 'norms' are well-known and published for your industry or process.¹ With cars it is law that such data is published, but that is an exception. However, there will be design figures for plant energy consumption, and there will be literature available that indicates a reasonable level of consumption for the products and processes concerned with your organisation.

To see how you compare with the norm is another crucial step - it not only shows you how well or otherwise you are performing, but it also shows how you compare with your competitors and that is becoming increasingly important today.

Often investments can be justified, and positive investment decisions rapidly made, by forecasting the effect that the proposed change will have on reducing the difference between your organisation energy performance and the good practice norm, and guaranteeing that monitoring will verify the results.

In a non-ferrous metal factory there were three identical furnaces. Examination of usage, consumption and output figures indicated that Furnace One consumed 78 litres of oil per tonne, Furnace Two 102 litres and Furnace Three 134 litres. The immediate reaction of the furnace department manager was that the figures were all wrong because the furnaces were identical; the reaction of the energy engineer was that each furnace was being operated differently as each had its own dedicated team. Investigation revealed that the original design figure was only 64 litres per tonne. Instantaneously all those involved with the furnaces realised that they could do better - much better.

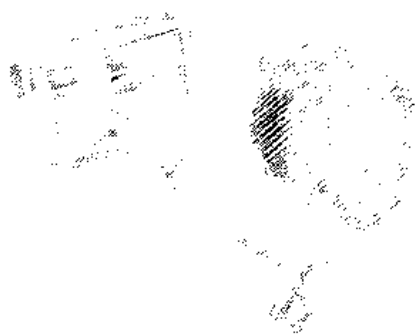
A detailed examination showed that there were four shift teams for each of the three furnaces, resulting in twelve different methods in operation, every one of which produced good quality output. It was only the energy usage that suffered.

A standardised process, based on the best aspects of each of the twelve methodologies, enhanced quality at an energy performance consistently better than design - some 60 litres per tonne. Better control of the process was established, enabling the improvements in performance to be maintained.

¹ The EEO publishes Energy Consumption Guides as part of its Best Practice programme. These guides survey energy use in specific processes, operations, plant and building types throughout the UK. Information is compiled on a non-attributable basis, enabling you to see how your energy use compares with that of your competitors. Where there is scope for improvement, lists of possible measures with likely paybacks are given to help you to make a start.

Fuel Efficiency Booklet No. 1 - 'Energy Audits for Industry' - Describes the four fundamental aspects of an energy management strategy. It is intended to act as a practical guide to help Work Engineers and Energy/Engineering Managers to make savings in site energy costs. Copies are available from the Energy Efficiency Enquiries Bureau, ETSU, Harwell, Didcot, Oxfordshire OX11 0RA. Tel: 01235 436747.

Modern electronic thermostats, accurate to within 0.5°C, will save 10 - 15% of fuel compared with older thermostats usually accurate only to within 2°C.



Audit

Auditing is the next formal stage. You have your facts and figures, you have compared these with good practice norms and you have a gap. An 'Energy Audit' will tell you why. There are no easy short cuts to an Audit. It is necessary to establish answers to the following questions, where appropriate, in each and every sector of your works or process:

- ? WHAT IS BEING DONE?
- ? WHY IS IT BEING DONE?
- ? WHY IS IT BEING DONE THAT WAY?
- ? COULD IT BE DONE ANOTHER WAY?
- ? COULD IT BE DONE THE SAME WAY BUT MORE EFFICIENTLY?
- ? ARE THE PRINCIPLES BEHIND THE PROCESS BEING CORRECTLY ADDRESSED?
- ? WHAT ENERGY IS BEING CONSUMED?
- ? WHAT ENERGY SHOULD BE CONSUMED?
- ? WHY IS THERE A DIFFERENCE?

And so on. Many more questions will suggest themselves to you once you get started.

The key ingredients required for this stage are a lively, enquiring mind. Staff who have been trained in work study are particularly adept at asking 'HOW? WHY? WHEN? WHERE?'.

By asking and obtaining answers to questions like those listed, you will acquire a mass of relevant information and at the same time help to secure the interest and future support of those whom you have involved. All of the information needs analysis and suggestions should be categorised according to the likely level of investment capital cost. Three categories are usually adequate: no, low and high capital cost.

The first of these categories - no cost - relates in the main to the clarification of responsibilities and improved motivation to save energy. It also covers the establishment of cost-effective working practices and the challenging of historic ones. As a general rule, the older the process, the greater the potential benefits in updating practices.

The second category - low cost - relates to such things as the installation of improved sensors and valving, and the addition of simple metering which is necessary to provide the right control information or to enable control to be exercised in a more appropriate fashion. For example, regular readings from an hours-run meter on a boiler or a piece of plant frequently trigger off a questioning process which will ultimately lead to substantial savings.

The third category - high cost - deals with major items like changing to more economical fuels, the use of more sophisticated plant, the installation of heat exchangers or more efficient boilers, process changes, and so on.

Many people still believe that energy conservation must involve the 'high cost' category straight away. There is generally significant no and low cost potential for saving, which will go a long way towards paying for the high cost items. In addition, unless the no cost and low cost solutions are applied, the benefits of a high cost route are likely to be eroded with time.

If you take a comprehensive approach, involving all three cost categories, you will find that benefits through energy conservation will increase with time and as fuel prices increase.

When selecting the order in which to implement solutions, don't forget Pareto's 80/20 rule - implementing 20% of the solutions may well reap 80% of the potential savings.

Action

Once armed with the opportunities categorised according to cost, the total problem should start to get easier and the solution clearer.

The options for moving forward will now depend on your organisation's size, culture and style. The following list gives examples of actions that can be taken, some of which will be suitable for your organisation.

- Appoint an individual to spearhead the energy management programme.
- Establish a 'Steering Group' of managers and staff to meet regularly, review progress and agree the next steps to be taken.
- Break down each energy saving opportunity into a series of small steps and agree who will achieve each step and by when.
- Wherever possible, integrate the various energy saving opportunities into your organisation's maintenance and investment programmes.
- Consider mirroring the approach taken for safety, which could involve:
 - making all managers and supervisors responsible for their own areas;
 - appointing a site energy manager;
 - establishing energy programmes;
 - agreeing actions;
 - regularly following-up actions and results;
 - removing nothing from the programme until it is fully implemented;
 - maintaining reduced consumption and publishing statistics regularly;
 - implementing no actions unless they are regarded as being safe working practices.
- Consider the 'Workshop' or Seminar approach.

A multi-site organisation with a high level of decentralised management was concerned to ensure, not only that energy was saved, but that it avoided 're-inventing the wheel' on each of its sites. The Group Financial Director became the figurehead for an energy saving programme.

Initially four sites were selected as representative of the total range of activities on all sixteen sites. These four sites were studied briefly, to identify and evaluate the many possible options for reducing energy usage. It was then decided to hold a 'workshop' to be attended by at least one representative from each of the sixteen sites, with the following objectives:

- to illustrate the range of options available for improving energy efficiency;
- to enable each site representative to plan what their site would aim to save over the next three years;
- to allow each site representative to present his plan to each of the other 15 representatives and seek their views.

The results were staggering. The workshop united all 16 sites with a common aim - to reduce energy usage by 10% each year for at least each of the next three years. At the end of the first year substantial savings had already been achieved. The group energy bill of £4,500,000 per annum had been reduced to £3,300,000, with many more energy savings actions still to be implemented.

Formal energy reduction has become a way of life. The workshop is now repeated every year, to review progress and to establish future reduction targets for each of the 16 sites for each of the next three years.

✓ You know what needs doing.

✓ You know, or should do, your own guidelines for seeking approval including expenditure approval.

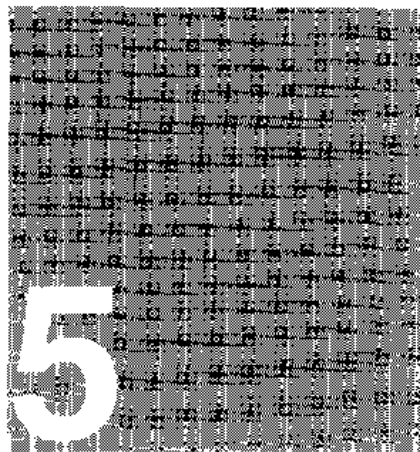
✓ You should have a good indication of time scales.

✓ You should have a good idea of any extra resources required.

✓ YOU SHOULD BE ABLE TO PUT FORWARD A REALISTIC IMPLEMENTATION PROGRAMME.

Savings of around 15% have been achieved by adopting and maintaining a similar approach to that taken for safety.





CASE HISTORIES

H J Heinz Co Ltd



In 1991 a decision was taken to undertake a pilot motivational programme at Europe's largest food manufacturing site, Heinz's Kitt Green plant. The programme's object was to effect a culture change within the organisation to increase awareness of energy costs and to increase accountability and ownership, thereby reducing consumption and costs.

The programme proposed the setting up of 'Energiser' teams trained in energy and utility saving methods for each profit centre. The teams would be encouraged to develop and implement their own ideas and savings would be monitored and credited to the teams responsible. It was anticipated that there would be a 'snowball effect' resulting from an enhanced awareness of energy costs which would spread to all levels of the work-force.

Specialist consultants were jointly involved; March Consulting Group, responsible for establishing the monitoring system, and Grafton Interaction, responsible for the motivational aspects of the programme.

Teams of 4-6 members representing all levels; including management, production operators, and maintenance staff, were set up in each profit centre (Beans, Soups, Varieties, Cans, Offices and Site Services). Members met regularly to generate and progress ideas for energy and utility savings.

The main motivation for teams came from a charity option, which rewarded teams by allowing them to give 10% of the savings they achieved to a charity of their choice, providing a strong incentive to save more.

People are motivated by different things and many members of the teams were motivated simply by problem solving and seeing the results of their efforts. However, Heinz agreed that 10% of savings could be put to a charitable use specified by the teams and this acted as an additional incentive for many people. Some of the charitable projects supported were: a TV for an ex-employee who had lost his legs; funding for a disabled girl to participate in the Paraplegic Games and a donation to a Lourdes trust. Proper presentations were made and wide publicity given within Heinz.

Also widely publicised was a monthly 'Golden Boot' award presented to the best performing team and this helped to generate a competitive spirit among the teams.

Energy savings during the weekend shutdown and restart were subject to careful scrutiny. Unnecessary lighting, ventilation, heating, compressed air, steam and equipment running were eliminated. Opportunities were identified to modify controls allowing critical equipment to be run while other machinery was shut down.

In addition to the direct savings in energy the teams identified some activities and processes which were no longer required. Waste occurring at product change-over were investigated and significant savings made in both material and water costs.

A Monitoring & Targeting system is currently being installed at Kitt Green, and all departments will shortly be receiving full reports on their energy and water usage.

The planned installation of metering to allocate energy costs to individual centres was delayed and not in operation during the project period. Delegation of energy budgets to the profit centres could not therefore be made.

The Beans Centre 'Energiser' team was well motivated, highly productive, well attended, and met regularly. Proposals by them generated significant savings. Further opportunities requiring capital outlay were stimulated, and sometimes the team was the driving force pressurising engineering staff to make changes. Energy, water and material waste from poor end of shift co-ordination were identified, and after continued pressure, savings were achieved. As a by-product of the activities, obsolete processes were identified and removed and process changes instigated. Savings were also achieved by other profit centres.

The Beans 'Energiser' team reformed at their own instigation in February 1993 and continue to have monthly meetings.

The following observations can be made:

- the overall project has been economically successful and has demonstrated that worth-while energy savings can be identified at working level.
- the project configuration was sufficiently flexible to accommodate changes as they occurred.
- management support is essential, particularly during the team building stages and where input is needed for projects requiring capital.
- ideally, metering to enable profit centres to track energy consumption should be in place before starting a motivation programme.

Full details of this project are to be published in New Practice Final Report and Final Profile No 57. Copies of both publications will be available from the Energy Efficiency Enquiries Bureau, ETSU, Harwell, Didcot, Oxfordshire OX11 0RA. Tel: 01235 436747 Fax: 01235 433066

Conserving Energy in the Chemical Industry

ALBRIGHT & WILSON

Albright and Wilson's Widnes Works produces about 60,000 tons of phosphorus-based products each year. Most products demand a high standard of purity, particularly the range of baking powders, and the phosphates used for meat and dairy processing and in the fermentation of yeast.

The key raw material is purified phosphoric acid. It is converted into various chemical compounds, mostly phosphorus salts, through use of reagents such as alkalis and the application of heat. The processes carried out are not particularly energy intensive compared with some other industries.

Widnes Works' overall energy consumption in 1991 amounted to 303 TJ (terajoules) (about 84 million kWh), equivalent to the heat generated from burning around 10,000 tons of coal. Although this is a substantial quantity, costing in the region of £1M, it has to be set against the 60,000 tons of products which are produced with a 'bottom line' value of around £30M a year.

One of the main thrusts of the company's present policies is to follow principles of 'responsible care' (as defined by the Chemical Industries Association²). At Widnes this has meant implementing a capital expenditure programme designed to bring all plant, including effluent treatment and atmospheric discharges, up to the highest possible environmental standards over the next five years.

'Responsible care' also concerns ensuring purity of products, continued commitment to the health and safety of workers, and energy conservation, all of which come under the 'Total Quality Management' (TQM) policy.

In 1990, Albright and Wilson set about motivating staff to conserve energy, emphasising the beneficial environmental impact that the action would have. Brainstorming meetings were held to come up with ideas on how to reduce energy consumption, and staff response was very favourable, showing an eagerness to get things done rather than to sit and talk about them.

Although the site is sixty years old, the production plants are modern, none being more than twelve years old, so there was little scope for dramatic energy savings. However, the brainstorming produced a list of over thirty items where savings could, in principle, be made. Each item was then analysed to determine the work that would be involved, and an estimate made of the potential saving. The most promising items were selected, and responsibility for each of the tasks involved in carrying them out was allocated. An energy-saving programme was up and running in double quick time.

The overall picture that emerged from the meeting was that there was potential for saving about 11% of the works' energy bill, worth £100,000 at 1990 energy costs.³

2 Further details about 'responsible care' are available from the Responsible Care Office, Chemical Industries Association, Kings Buildings, Smith Square, London SW1P 3JJ. Tel No: 071 834 3399.

To encourage 'responsible care', a joint publication of the Energy Efficiency Office and the Chemical Industries Association entitled 'Responsible Energy - A Practical Guide to Energy Efficiency' was produced. It aims to give companies a simple way of identifying areas in which they can improve energy efficiency, and contains information to enable them to follow their ideas through. Copies of the Guide can be obtained from the Chemical Industries Association.

3 The possibility also existed for saving around twice that amount through the design and installation of a combined heat and power (CHP) scheme, at a capital cost of about £1M. This option has been deferred in the present economic climate and with present energy costs, but remains under consideration for the future. There is no snug balance between heat and power loads on this site (power load has a maximum of about 1 MW), but even so a five-year payback is expected from the scheme when implemented.

Potential economies could be made in two main areas: in technical improvement of processes; and, of greater importance, by paying more attention to good housekeeping practices.

One of the major savings at Widnes has been made in the steam mains and services area. Steam is generated in a central boiler, fired by heavy fuel oil, and then fed to the points of use, e.g. for processes which have to be kept up to temperature, for vaporisation and for space heating of the offices. Condensate from the various processes is returned to the boiler.

Wear and tear had resulted in: leaks in the pipework; leaks in sumps; faults in the lagging (or its absence, perhaps due to modification); and faults, such as breakdown of a pump resulting in the condensate from one area not being returned to the boiler.

As a result of the brainstorming session, these problems were looked at systematically and individuals were allocated responsibility for specific areas of the works. Responsibilities included identifying leaks and other faults, and organising their repair either by the works' maintenance department or by external organisations if the job was too big to handle internally. Steam lost via leaks was estimated to cost Albright and Wilson over £13,000 each year. Repairing the leaks cost just £1,500, saving £11,500 in the first year and £13,000 in each subsequent year. In-house correction of the smaller faults has resulted in additional savings of about £15,000 per year.

Substantial savings have been made by encouraging care and attention to good housekeeping, e.g. simply switching off equipment when not required. One of the changes implemented after the brainstorming session was to interlock fan operation with that of the filters, so that they only ran when the filters did.

The Shift Supervisor on night duty, who had experience of process operation, drew a series of posters to remind night-shift workers of the savings they could make simply by switching off ancillary equipment when not required. Similar publicity was used to encourage economy in the offices, which were too small to justify the expense of installing sensor-controlled lighting.

Measurement is an essential tool of the TQM approach so renewed attention has been paid to metering. In his own time and on his own initiative, one manager developed software that could be applied to track savings via the meter readings.

Savings continue to be made through technical changes to the various processes in operation at Widnes. One example, on which work is still in progress, relates to the Calgon furnace, the fuel consumption of which is being evaluated in terms of statistical process control. When completed, it is estimated that savings of about the same size as those achieved by 'fettling' the steam circuits will be obtained by improving heat recovery and modifying the furnace temperature.

All of the work at Albright and Wilson has been progressed informally. The works employs around 160 people, of whom 45 are staff and management. The style of energy management campaign run has generated enthusiasm for the subject, and whenever possible, resources have been provided to enable workers to carry through their own energy-saving ideas. In 1991, the energy consumed per ton of product fell by about 4% compared with the previous year, saving almost 11% of the fuel bill or nearly £90,000. The only problem which now remains is how to keep motivation up!

Considerable savings have been achieved by encouraging staff follow good housekeeping practices, and by ensuring all repairs are carried out as quickly as possible.



Sharper Focus at Avon

At Avon Tyres' factory in Melksham, Wiltshire, it was originally felt that time and money spent on trying to save energy would not prove a worthwhile investment. Following a re-think, however, things have changed.

Sales of the factory's tyres generate about £80M a year. Energy costs amount to almost £4M, of which close to 68% goes on steam, 30% on electricity and 2% on gas.

The first reports and recommendations of the Energy Conservation Engineer were mainly ignored by busy production people, intent on ensuring smooth flow of high quality output. They saw little purpose in attempting to make 'trivial' savings that might complicate or constrain their main function.

Reorganisation of factory management, applying the philosophy of the 'focused factory', has led to a different attitude towards energy saving. The various departments responsible for production, maintenance, logistics, and tyre design and development are no longer separated, each with their own responsibilities. Now, various sections of the factory are each treated as separate mini-factories in management terms, each with their own Manager. This reorganisation was combined with a drive to reduce costs and so taking energy-saving measures became a necessity.

When the message went out to 'Focus on what you can do', seemingly minor actions such as turning off machinery not in current use saved about £10,000 in a year. Limited savings have also been made through engineering improvements. For example, thyristor speed control permits mixing at optimum power consumption.

Extensive use of steam can also lead to extravagance and waste. For instance, at weekends the use of only one machine often involved keeping a long length of steam main in use, resulting in heat losses out of proportion to the amount of steam used. Now, all energy use is recorded and the user is notified of the consumption levels. The recording software has been modified to print out weekend use separately, to enable any problems or excessive usage to be analysed and corrective action taken.

The Factory Services Manager, Mike Hinds, is dealing with extensive steam mains where energy is lost at many points by steam and air leaks, resulting in no one person feeling personally responsible for the waste. Mike insists that by pushing responsibility 'down the tree as far as we can', small projects in large numbers will save as much money as a few large management show-pieces.

Encouraging all staff to feel responsible for energy usage has resulted in lots of small energy saving projects being implemented, and has achieved considerable savings.

British Rail (Southern Region)

Background

British Rail's (BR's) key function is to transform energy into transportation services - and to do so efficiently. Few organisations are more energy-intensive.



That's why BR's largest single non-paybill cost is energy, which covers electricity (plus diesel fuel) for traction followed by electricity (plus some gas and water) for buildings. Three major management efforts are therefore essential:

- 1 Optimal investment in technical equipment designed to maximise energy economy, though severely finance-constrained.
- 2 Optimal negotiating skills in the purchase of energy on the best terms, though severely market-constrained.
- 3 Optimal staff motivation and training (plus some customer motivation) in getting the best out of the technical investment and of the energy which is purchased, though severely psychologically-constrained.

The psychological constraints are dictated by human nature. From the individual employee's viewpoint, the day-to-day use of energy is repetitive, hardly noticed and boring. Unlike the situation in their homes, someone else pays the bills resulting in little personal concern. To remedy this, BR's Southern Region, pioneering on behalf of Network SouthEast, called in professional consultants in 1988, only three years after having set up Regional Energy Management.

In extremely close co-operation with both energy personnel and top management, Grafton Interaction began by stimulating a lively and frank dialogue with as many staff members as possible, starting with the greatest energy users, i.e. train drivers, and then with guards, and finally station, depot and ancillary staff. Group discussions, with no holds barred, soon led to a systematic and detailed research dialogue.

Opening a Dialogue for Research as well as Motivation Purposes

Face-to-face group discussions and a carefully structured questionnaire combined fact-finding with personal involvement. There were two specific objectives:

- to identify where and why energy waste occurred and to gather suggestions for reducing it;
- to identify potential enthusiasts for the energy efficiency cause - the 'banner bearers' - who would then act as grass roots wastewatchers.

The first questions were aimed at stimulating the respondent's personal interest. They addressed working problems, individual needs, inevitable complaints and ideas for improvement. Variations in the questionnaire's wording took account of the different functions of drivers, guards, depot workers, station staff, office staff and ancillary staff.

Respondents were then asked for their frank views on the realities of energy waste at their work place, on the causes for this waste and suggestions for remedy. Finally, questions were asked about morale, about perceived management behaviour and about desires for personal recognition, for incentives and rewards.

A relatively large sample of employees in five typical areas and depots, received a personal letter from their own manager, sent to their home address, enclosing the tailor-made questionnaire.

The response rate was pleasingly high, despite poor morale at the time, justifying the care that had gone into wording the letters and questionnaires. Some answers were extremely detailed, immediately identifying potential 'banner bearers'. Each respondent received a 'thank you' letter from their manager. Potential 'banner bearers' were contacted personally.

The results went beyond the energy efficiency issue - opening up two-way communication proved an ideal opportunity to counteract poor morale.

The interactive approach treated individuals at all staff levels not as culpable energy wasters, but as responsible and intelligent team members whose views were sought, and who were given feedback, thanks and attractive incentive rewards for their personal efforts and ideas.

First Feedback

The response from group discussions and questionnaires produced a wealth of information and practical suggestions. Some feedback was brought to management's attention instantly, even before the systematic recommendations for action were completed.

In one engineering depot three men had discovered overcharging by an energy supplier and secured a refund of £25,000. Such a wonderful effort required immediate reward and recognition from management on a higher level. Within days, a private luncheon party was organised in the VIP Dining Room at Waterloo Station. The three employees and their wives heard the Deputy General Manager pay them a glowing tribute and hand them cheques as a 'thank you'.

Threatened staff departures due to plans to move a train crew depot had resulted in grave demoralisation. An instant review of the decision by management as soon as they were alerted by the consultants led to a change in decision. Considerable damage to industrial relations and substantial extra costs were avoided.

Technical Feedback

Train drivers and guards provided feedback on: problems with existing rolling stock; discomfort inside the driver's cab and the brake van; problems with controls, tools, maintenance and fault-reporting routines; and problems with coasting boards. All this information was reported to BR's technical staff for action straight away, going beyond energy-saving motivation (and yet indirectly supporting that motivation).

Depot, station and office staff provided real-life feedback and proposals on: building design; needs for refurbishment, draught-proofing of doors and windows; more effective maintenance and repair systems; reviewing heating installations and thermostats; dealing with lighting systems, time switches, water taps, pipe lagging or, with diesel fuel, guns lacking controls. Here, too, immediate alerting of technical staff took place.

Human Feedback

Through opening two-way communication, train drivers (and guards) had a chance to talk about 'coasting', which is by far the most important opportunity for energy saving, yet frequently frustrated by time-keeping problems and by poor co-operation from signalmen. They also gave valuable hints on train heating and lighting controls, on cutting out power when berthing and on cutting-in for pre-heating of trains. Lack of passenger co-operation in Winter was also brought up.

Buildings staff drew attention to the prevalence of lighting and heating left on when not required, water taps left running, kettles being boiled and not used, doors and windows left open, faults going unreported, leaks being unrepaired and heat being allowed to escape, often through inadequate lagging.

Finally, train crews and buildings staff were able to comment on ideas for incentive rewards. A number of requests for better wages and monetary compensation were inevitably included, but even this gave valuable feedback.

From all sections of the staff the most important feedback referred to morale, to the need for improved management-staff relations and to the need for personal recognition of performance. Nearly everybody welcomed the opening of dialogue, but expressed the suspicion that it might be a mere 'flavour of the month' and soon fizzle out.

All of the feedback messages were then reviewed during group discussions between 'banner bearers' and the management consultants. The outcome enabled the consultants to approach the management with systematic proposals for action which could be implemented at the five test areas and locations.

Action

As a result of two-way communication with the Region's staff in five test areas/locations, small groups of 'banner bearers' were identified to develop ideas, procedures and supporting material. The aim was to raise the profile of energy efficiency from a boring, 'cost-cutting' exercise to something exciting ('Energy wastewatching can be fun').

Part-time Energy Managers were appointed in a growing number of areas/locations, and kept in close contact with the new 'banner bearers'.

The inaugural profile-raising event was a presentation of the findings from the first survey to 100 managers, supervisors, drivers and other staff in the House of Commons. The event was hosted and addressed by the Energy Minister and MPs from the House of Commons Select Committee on Energy. Participants were given a questionnaire asking for their considered views on some of the following proposals for further action.

Traction Energy (80% of BR's energy cost! Each driver can save up to £7,000 per year.):

- Make a sustained effort to improve train drivers' coasting practices - the largest single potential for improving BR's energy utilisation.
- Organise, within realistic constraints, regular "Train Drivers' Get-Togethers on Coasting. Invite some signalmen, as their co-operation is essential in order to avoid unnecessary hold-ups.
- Get Traction Inspectors to include coasting maximisation during their cab rides.
- Make sure that train drivers' general training sessions devote adequate time to coasting skills, using a new video on coasting.
- Organise imaginative reward events for achievements. For example, arrange steam excursions for BR staff's handicapped children financed from additional electricity savings through coasting and more controlled use of lighting/heating on trains.
- Design a 'Coasting Symbol' graphic to be used on all coasting-related print, badges, ties, etc. Hand out badges and ties in recognition of good coasting performance.

Buildings Energy:

- Organise an Energy Action Group in each area or important location, consisting mainly of 'banner bearers' to assist the Energy Manager to implement all initiatives and produce new ideas.
- Rejuvenate the existing 'Goal-keeper of the Year' competitions between stations, by taking England World Cup winning Goalkeeper Gordon Banks on a whistle-stop tour of all main stations.
- Organise a 'Depot Energy Shield Competition' (with an outside sponsor).

General:

- Produce an 'Energy Management Check-list' for local Energy Managers, in the form of a poster and a pocket card, on similar lines to the 'Coasting Check-list' already produced for Drivers.

Results

After two years of working with Grafton Interaction coasting performance has improved considerably and a significant improvement has been made in energy efficiency

"Drivers' coasting performance improved from 60% to 80% efficiency. The average efficiency for 1991/92 was 19.94 kWh per train mile compared with 21.78 kWh back in 1985/86, a saving of 9%. Each kWh of electricity costs an average of 4.5 pence."

John Evans
Network Energy Consultant



Staff Awareness at Waterford

The three factories of Waterford Crystal in Ireland spend £2M a year on energy. In an effort to attack these costs, consumer awareness teams (CATs) were formed to promote energy efficiency.

The CATs met once a week to think of ways of making savings. They then tested, implemented and continuously monitored the application of their ideas in the workplace, and at the same time persuaded the work-force as a whole to adopt the ideas by demonstrating the gains to the company.

Throughout 1991 it became obvious that a special attention was needed on a number of energy-related fronts, and that a thorough overall examination by outside specialists in energy conservation was required.

With encouragement from the local Electricity Supply Board, Waterford Crystal invited the March Consulting Group to conduct an energy audit in all three factories with a view to identifying projects which could be implemented, categorised by potential short-, medium- or long-term payback.

When the consultants completed their report, they were asked to implement those recommendations they had outlined as short-term payback projects. These were:

- further sub-metering of energy so that accountability could be placed on individual departments or plant;
- exact identification of where energy costs could be reduced by introducing better control over processes and services, and where specific people could be made accountable;
- a weekly reporting system to be established for each department which would highlight trends in expenditure;
- a campaign to be launched which would promote greater awareness of energy costs throughout the company;
- a summary of savings achieved to be published, together with potential further savings.

"Energy saving is a hard grind but absolutely essential. Proper housekeeping is vital and there is a constant need to impress on people that they have to turn off taps, switch off lights and switch off machines and services. There is an ongoing task to double check."

John O'Leary
Energy Manager
Waterford Crystal

With these recommendations in operation, savings equivalent to £80,000 year have been made across the three sites.

Key factors in the consultants' recommendations were that the CAT teams must continue their work and that managers must accept responsibility for the energy costs of their own departments. The measures that have been implemented have been described as a 'new culture'

Awareness levels have been kept up by holding works' competitions when staff might be asked to estimate how much water or gas has been used at the factory in the last week. The winner receives a free weekend at a motel. The correct answer is publicised, and it is hoped that this stimulates even the losers to turn off unwanted taps once they discover that the factory gets through two million gallons of water in a week.

Managing Energy Waste at PPG

PPG Industries (UK) Ltd achieved a saving of £250,000 in 14 months for an outlay of just £70,000 in a campaign master-minded by Utilities Engineer Brian Murphy.

Brian's professional interest in energy management was aroused when, as a consultant, he was appointed Commissioning Engineer at the company's new fibre glass plant at Wigan. Getting to know the plant well enough to smooth out its teething troubles as it came into use, also meant acquiring a ready appreciation of how to operate it most economically in terms of energy consumption. With this knowledge, Brian changed jobs and took responsibility for utilities.

The PPG American parent company has to be very energy conscious, since the group spent \$300M on energy world-wide in 1991, and has formed a Corporate Energy Council to plan and promote its energy policy. Brian was sent to the US to study their methods, to enable him to specify the most effective investment that could be made to save energy at the Wigan plant and to prove its potential to management.

There are seven main points that Brian has learnt and acted upon:

- 1 Making people aware of the costs involved in using energy makes them more likely to suggest ways of saving it.
- 2 Management has to set an example. If the Managing Director is seen to leave his light on all the time, why should the work force act any differently?
- 3 People will always agree that energy efficiency is an integral part of any business strategy, but unless comments are turned into action their agreement is wasted.
- 4 The 'ownership' of energy costs needs to be an integral part of the drive to motivate staff and management. Unless people are hit with the costs of their own actions, they cannot be expected to react fully to those costs.
- 5 Every major user needs a dedicated Energy Manager whose job is not only co-ordinating the energy-saving programme, but also being very active in the day-to-day management of energy consumption.
- 6 Making people aware of past and current energy-saving projects gives them a knowledge of the techniques that have been used and encourages them to look for other applications. They should also be told of other techniques that are available but have not yet been used at their plant.
- 7 People need to see their suggestions acted upon, otherwise they will lose interest and the momentum will be lost.

Achievements in energy saving at all the company's plants are described and commented on in a company magazine, 'Energy Lines', which keeps interest up and educates its readers to other aspects of energy saving as well as those at their own plants.

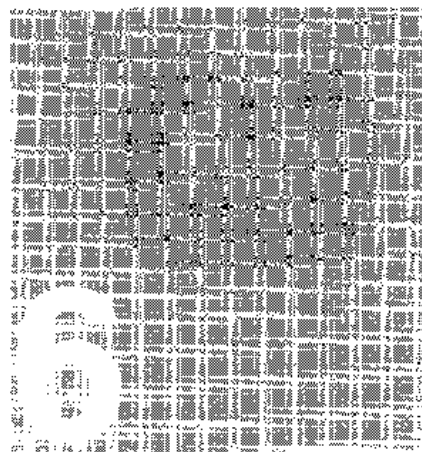
The Wigan plant's total energy bill represents about 10% of production costs. Experience indicates that 40% of energy savings are achieved by technical refinements and 60% by attention to energy management.

Passing his own motivation on to the people on the ground has been one of the big challenges facing Brian Murphy. He understands that not all economy measures, once put in place, are permanent. Many need unrelenting attention and these include purchasing, bill-checking and consumption checks within the plant.



"Energy conservation is the most important business strategy for the future. It is a natural extension of the environmental responsibility that is the heart of PPG."

Chuck Birch
Corporate Energy Council
Chairman
PPG US Parent Company



MAKING CERTAIN OF SUCCESS

This chapter

- examines the general themes giving rise to success in the earlier case studies;
- discusses many of the myths or misconceptions about energy management and puts a true perspective on them;
- summarises the energy management function or role;
- summarises the motivational needs inherent in those roles;
- shows how motivational needs can be met.

However unusual or apparently difficult your own situation, it is not as difficult as it sounds to motivate staff and to achieve lasting results by managing energy.

Themes of Success

- ✓ Attention to energy issues requires maximum attention to people and their motivation. Energy saving involves management, creating an interest in the subject and continually monitoring that interest.
- ✓ Simplicity is very important. Keeping things simple has a self-motivating effect, because people are more likely to be motivated by and implement ideas that are easily understood. With this in mind, it makes sense to integrate energy matters into the existing routine systems and procedures of your organisation, rather than to create new ones which will require learning time prior to implementation.
- ✓ Try to reflect your organisation's style and culture in what is done. Build on what people already understand, what they are used to following and achieving results in the process.
- ✓ Irrespective of what some people say, creating wealth and making money, is important to us all - it is what we do with it that is more debatable. All this should be reflected in motivating staff to save energy by first seeking out the no and low capital cost solutions. There is nothing like a strong positive cash flow to encourage management backing and a wish to do even better. The early savings and benefits may be used subsequently to fund some higher cost opportunities, such that the overall programme becomes self financing.
- ✓ The formal appointment of an Energy Manager is not necessarily essential, as is often implied. Neither are the recruitment of additional staff, dedicated staff or specialist staff always essential either. The *real* essential is the formal allocation of ownership of energy and, in the more energy intensive situations, the achievements tend to be greater when ownership is formally allocated to Line Management.
- ✓ Figures of energy consumed, especially if expressed as indices of performance (e.g. energy purchased per unit of product sold), have a strong motivational effect everywhere. Indeed, the measurement of energy consumption at regular intervals, and the comparison of these figures as an index of performance, is crucial both in achieving and maintaining improvements.
- ✓ Motivation to manage energy has huge 'spin-offs' in other activities. For example, addressing energy efficiency may automatically result in environmental issues being considered in sufficient depth to avoid the need for further significant environmental action. Also, without exception, big financial savings and other benefits, such as quality improvement and enhanced safety, may be achieved. Typically a reduction in energy requirement of up to 20% will be achieved over a reasonable timescale, with smaller percentage reductions continuing from then on.

- ✓ Financial incentives have a strong motivational effect. These are not necessarily personal rewards to individuals, but may be additional investment linked to, or a charity project funded by, savings achieved. The attraction of overcoming the threat of manpower reductions by meeting cost reduction targets is often a motivating factor.

There is a very strong commercial case for pursuing energy management. It is a paying proposition.

Myths and Misconceptions

This section explores some of the myths and misconceptions about energy management - and explodes them!

- ✗ **"Energy management is exclusive to large companies"**
This is not true. Whilst the UK's 200 largest companies do account for 60% of the industrial sector's energy requirement, energy efficiency reduces costs and increases profits in all organisations, whatever their size.
- ✗ **"We'll need additional staff"**
This is not true. Many companies do not have an Energy Manager. Ideally, the Buyer negotiates energy purchases; the Production Management is responsible for efficient running of the plant; the Accountants produce supportive facts, figures and indices of performance for output, costs and their composition, including the energy element; and all this is co-ordinated by a Senior Manager or Director.
- ✗ **"We'll need in-house expertise"**
In practice there is an abundance of external expertise available and in most cases this is free of charge. Besides Government sponsored initiatives, including the Energy Efficiency Office, ETSU, BRECSU and Regional Energy Efficiency Offices, all of the fuel supply companies provide technical support facilities. In the majority of cases all this information and expertise is available free of charge.
- ✗ **"We're going to need investment capital"**
By addressing basic housekeeping, no-cost issues first, and then low-cost issues such as minor maintenance items next, the savings made will go a long way towards - or in many cases totally cover - the cost of financing the rest of the programme.
- ✗ **"Our employees aren't interested"**
Experience has shown this to be a supervisory/management excuse rather than a fact. Employees are well aware that an efficiently managed, cost-conscious company, has a much greater chance of survival. Energy efficiency contributes to long term job security, so employees are naturally inclined to take an interest in the subject, particularly when commitment to energy matters is seen to gravitate right down the line.

Every extra 1°C of space heating adds 10% to the heating costs

It is possible to overcome all these misconceptions and create a positive attitude and approach to energy management throughout any organisation.

Summary of the Energy Management Role

At all levels, and in all situations, the energy management role is essentially catalytic. It includes:

- involving people;
- making it happen;
- selling/persuading;
- using the 'power' in energy management control information;
- developing and presenting the case to invest capital in energy conservation;

- maintaining improvements;
- ensuring that energy management continues as a way of life, rather than a one-off exercise which is designed to meet short term crises and then forgotten.

In addition to meeting these motivational needs, those in energy management roles will have to complete five stages of action: audit; critical examination; action programme; targets; controls.

Each of these stages is discussed below. It is emphasised that all stages should be reviewed on a continuing basis, as part of the energy management function.

Audit

Auditing costs money and saves nothing in itself - but without it you won't know where to start.

An energy audit is necessary to identify the main areas of usage and the approximate quantities involved. The end result should be a list of key areas of usage pointing to where the most potential for saving exists.

- Absolute accuracy is not vital.
- Absence of meters is not an excuse for omitting the audit stage.

Critical Examination

Having got your list of key areas of usage, each area must now come under critical examination in order to identify what is done, what could be done, what should be done and so on. Question all those involved vigorously, placing particular emphasis on process times, process safety margins, operating patterns and the impact of improved production control, labour control or both.

- Examine each area of usage in isolation.
- Examine each area of usage in relation to neighbouring areas.
- Examine each area of usage in relation to the total process.

- Determine how, why, where, what, when and who for each area.
- Eliminate areas which cannot be changed, combine areas which are linked, and simplify wherever possible.
- Explore technical opportunities - just because an expert or experts designed and laid down the process originally, that is no reason why you should not question it - BE BOLD.

Action Programmes

Now that you have a good idea of what's going on, you need to come up with actions to improve the current situation. Draw up three lists of possible actions, categorised as no-cost, low-cost and high-cost opportunities. Include the following:

- an order or priority;
- the key tasks involved;
- the resources required;
- the timescale recommended/agreed;
- the individual responsible for ensuring completion;
- the agreed completion date.

Targets

Targets are crucial to success. When setting targets remember:

- Keep them realistic.
- If possible, calculate, consult and agree them with those involved before publishing. If nobody seems interested, set one yourself and publish it.
- Relate them to output or other factors which represent usage.

Most solutions will come to light during the critical examination.

How can you achieve anything if you have nothing to aim for?

- Keep the units simple and easy to understand, e.g. kilograms of steam per litre of oil, kWh per unit produced.
- Regular control information is essential to keep interest up and make the targets real.

Control Information

Control information is the final stage of energy management, and can only be properly understood if the previous stages have all been completed.

- Make the information simple and easy to understand.
- Show the targets clearly, to enable comparison with actual results.
- Highlight unexpected results, to make people want to find out why they happened.
- If possible, get the energy users to calculate the information as well, so that any discrepancies come to light.
- Circulate copies of relevant information to all involved. The frequency of circulation should coincide with significant events in the energy usage or at logical breaks (every shift, every month, etc), and should occur sufficiently soon after an event to allow follow-up action to be effective.
- Follow-up action must be seen to be taken and its effects noted on the information circulated.

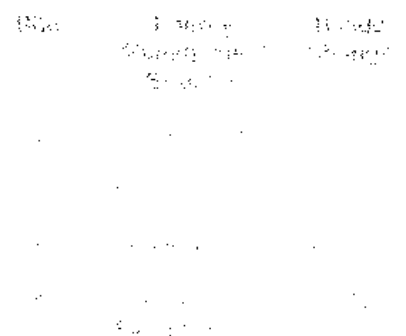
Control information shows the current energy situation and keeps everyone up-to-date with what's happening. Things won't change until the real situation is known.

Motivational Needs

Many of the motivational needs of good energy management have been covered throughout this guide. This section provides a check-list of some of the main needs to be remembered. There are many other points which may prove particularly important in your organisation, but those listed are generally essential if you are to persuade people at all levels to pay better attention to energy use.

- ✓ **Commitment**
Ideally this will come from the top - try and make sure it does!. People tend to be motivated by example - if there is no commitment at the top of an organisation, there is unlikely to be any lower down.
- ✓ **Importance**
Emphasise what effect energy use and cost has on the organisation. For example, what proportion of the direct or controllable costs does energy represent.
- ✓ **Involve people**
One of the most crucial aspects of energy management is the involvement of people. The penalties of ignoring people are severe.
- ✓ **Attitude**
Energy should be treated in the same way as human or material resources to stress its importance.
- ✓ **Use of available information**
Essential for energy management. If information is not already available, set about generating it.
- ✓ **Organisation, duties and responsibilities**
Clarify all these and ensure indirect staff, such as boilermens, are as closely supervised as the direct or line staff.
- ✓ **Communications**
Ensure the appropriate channels of communication exist. If they don't, create them.

A multi-site organisation attempted to achieve energy improvements on some sites without involving people, and by relying on electronics instead. The results were disastrous. After three months, two identical sites were showing gains in usage of only small reductions, compared with impressive reductions at similar sites where people were also involved. The figures shown for themselves.



- ✓ **Impact on profit**
For energy saving projects, paybacks tend to change with time, i.e. they decrease as fuel prices increase and vice versa.
- ✓ **Use existing, proven technology**
Technology continues to evolve and improvements are added through feedback. It is easier to get ideas approved when the results can speak for themselves.
- ✓ **Design**
Aim for designs with lower operating costs *and* energy costs.

Meeting the Motivational Needs

It is generally found that many of the motivational needs of energy management can be met by the application of some five disciplines, as follows:

- objective clarification of individual roles and responsibilities, i.e. job descriptions;
- work study;
- Monitoring and Targeting;
- creating change;
- common sense.

Job Descriptions

Job descriptions should be produced and critically analysed. Not only will this clarify duties and responsibilities, but it will also makes people think about them. For example:

- How many people believe that an Energy Manager is solely responsible for energy? Most do, yet in reality their role is catalytic and they need support to succeed; e.g. they cannot switch production equipment on and off, as that is a production role, and yet it influences energy use.
- How many people believe the chief responsibility of a Production Manager is to ensure output is produced? Many used to, and yet in practice, they are only effective if they create wealth at the same time.
- How many Service Managers regard energy as somebody else's job, but if they don't account for it, who does?
- Do other support functions concentrate on the key issues?

Work Study

Work study is an excellent formal approach to learning analytical skills and developing better methods, backed up and maintained by measurement and indices of performance. It is valuable for anybody concerned with energy management, as long as it is applied flexibly and with real regard for human needs.

Monitoring and Targeting

Monitoring and Targeting (M&T), as frequently mentioned in this guide, is a disciplined approach to energy management, ensuring that all energy resources are used to produce the maximum economic benefit. M&T deals with both the on-going control of energy use and planned efficiency improvements.

Several publications on M&T and its application in energy management have been published by the Energy Efficiency Office. Your Regional Energy Efficiency Office will be able to supply you with information relevant to your organisation on request.

An Accountant highlighted £2,000 of overtime in one month in a large energy intensive industry, but did not mention that the monthly energy bill, at £50,000, amounted to 25 times the overtime paid. When this fact came to light, the Production Department rounded energy instead of overtime, and costs fell by £13,000 per month - enough to pay for the entire Accounts Department!

Creating Change (With or Without Capital Expenditure)

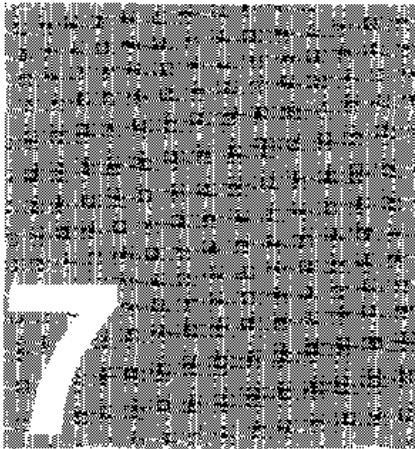
In any situation where change is required, it is first necessary to **CREATE AWARENESS** that the subject is worth considering, and then to **PERSUADE** those with the authority to approve that it is your changes which should be adopted. Questions and other tips to assist in these processes are included in the next chapter of this guide.

Common Sense

Energy management is all about applying common sense. The additional 'tips' below are given because experience has shown they are helpful in motivating people to respect energy.

- Be aware of the contents of the Capital Budget. The Board is more likely to approve a request for which allowance has already been made in a budget. Make sure you know what competition exists for scarce capital resources and highlight the fact that energy projects are unlikely to create industrial relations complications.
- Anticipate objections and plan and rehearse your replies. In any case, always have an alternative recommendation to fall back on should the first request be turned down. In some circumstances, it may be appropriate to have two or more alternatives.
- Pre-sell as many ideas as you can in advance to individuals who will be making the decisions. If possible, talk the proposals through beforehand, in detail, with the Accountant or Financial Director, and get him on your side. He is bound to be asked by the Board what he thinks of your proposals.
- Show how savings will be monitored and confirmed on completion of the project (i.e. by objective use of the control information already established). In certain situations, it may be worth mentioning that the anticipated payback on an energy project is more reliable than that of a manufacturing project and, unlike the latter, benefits tend to increase as fuel prices rise.
- Highlight energy saving achievements, especially those that have incurred no capital outlay. Savings will always stimulate interest at Board level and whet the appetite for more. Also, be aware if quality or productivity gains are likely to be made by implementing an energy saving project, and if so, stress these.
- Progress and follow up your proposals and requests for capital approval. Always maintain the interest otherwise your proposals may get forgotten. If all your proposals are turned down, ask for the reasons why and remember them for future proposals.
- While proposals are being considered, publish energy usage figures as simple indices, e.g. kilograms of steam per litre of oil, therms of gas per tonne of output. (There is no need to wait until instructed before publishing and circulating these. Just do it and start raising awareness.) At the same time, set targets. If people are already interested in energy, seek participation and get collaboration when setting them. If you are just starting out and others are not yet involved, set a reasonable target yourself and publish it. There will nearly always be somebody who has a go at achieving it.
- Finally, always be **ENTHUSIASTIC** and **PATIENT** and, above all, **DON'T GIVE UP**.

Good Practice Guide 69 - 'Investment Appraisal for Industrial Energy Efficiency' - reviews appraisal techniques used to make decisions related to investment in energy efficiency measures. Copies are available from the Energy Efficiency Enquiries Bureau, FTSU, Harwell, Didcot, Oxfordshire OX11 0RA. Tel: 01235 436747.



FORMULATING YOUR OWN PLAN

Approach

This chapter aims to bring out some of the essential principles which you need to follow in order to achieve significant energy savings in a straightforward, relatively simple and lasting manner.

Here are the key principles for success, set out in the form of a check-list:

Energy management remains one issue in the UK today with scope for considerable progress.

- ✓ Establish energy as a management issue.
- ✓ Give each line department their own energy budgets.
- ✓ Calculate a simple index of performance for each building, process plant, group of buildings, site or sites.
- ✓ Calculate the performance index weekly, or more frequently in energy intensive situations.
- ✓ Complete all calculations manually to start with - don't computerise them until everyone involved is happy with what is being measured.
- ✓ Establish an overall energy policy at an early stage;
- ✓ Categorise savings opportunities into no, low and high cost - energy management is concerned with achieving the no cost and low cost opportunities first.

The following example, although based on a buildings situation, is universally applicable.

Some months ago, an organisation with several thousand buildings and a total annual energy bill of £45 million reviewed its energy performance. Despite considerable attention over the past years, the annual energy consumption was both static and excessive.

An outline analysis of past annual energy usage for each building revealed that Pareto's principle applied - just under 20% of the buildings consumed more than 80% of the total energy. The very first decision taken then was to concentrate on this 20%. This reduced the problem considerably, but it still left several hundred buildings to consider and £36 million on fuel expenditure.

The second decision taken was to look at organisational structures. In this particular concern, the majority of the £36 million fuel bill was run up in the two major line departments. Previously, the Technical Department had been nominally responsible for all energy use, but no longer. The line departments consumed that energy and so their staff were made responsible for their own consumption, and for the first time each line department held an energy budget.

This approach in itself sharpened up both the line departments and the Technical Department: the former because they now had ownership of the opportunities, and rightly so: the latter because they were now freed from responsibility for the line department's energy performance, over which they had no direct control and could become truly a 'service only' department, able to concentrate 100% on giving that service.

The third decision was to look at organisational boundaries. For example, for management purposes this organisation was divided up into six sub-regions, so why should it be any different for energy?

By taking this approach, the several thousand buildings were reduced to several hundred, in two mainline departments across six sub-regions. In practice, this further divided into twelve groups of between 50 and 70 buildings each, with an average annual energy consumption per group of about £3 million. These were called 'manageable groups' and nearly everybody saw that the problem had been cut down to a manageable size.

One group was then treated as the pilot group. Working building by building, the same principles were followed. Firstly, ownership of energy use had to be clarified and a capable individual made responsible from the line function, rather than one from the technical support departments. Secondly, to help fulfil that responsibility, a simple index of performance was established and calculated weekly. The index was kept simple such that absolute accuracy was not essential, so long as a trend was discernible.

Initially, the index was calculated manually to ensure all those involved knew and understood what they were doing and why.

A year later, this organisation was well on target towards achieving its first goal of £6 million per year of energy savings **without capital expenditure**. Expenditure may come later to increase savings further, funded in part from those savings already achieved.

Many initial barriers at this organisation have been overcome. Bluntly, there is often too much talk about energy and too little action. This energy management programme was entirely action-orientated. Energy is not always perceived as a management issue, but it is, and this programme positioned it as such; for example, by transferring the energy budget to the line departments. All too frequently there is ignorance of current usage and no indices of performance - both of these things were corrected by the programme introduced. Meters were read weekly, the consumption calculated and the results compared with a crude goal, which had been determined independently in accordance with the thermal properties of the building. Please note the term 'crude goal' because absolute accuracy is not essential and far less time is spent establishing 'crude goals'. Furthermore, once there is a mechanism in place for deliberately reviewing performance at frequent intervals, say weekly, then savings will be achieved irrespective of whether or not a goal has been set. A goal, however, does help to ensure these savings are maintained and people are encouraged by having something to aim at, so it is important to have one.

So far so good, but the programme did not stop here. Previously in the organisation there had been a view that energy saving requires capital expenditure, but that was 'exploded'. The programme showed that it is the no cost and low cost areas that provide the quickest and cheapest savings. By categorising the opportunities into those requiring no, low and high capital, the actions were prioritised. Regular monitoring achieved the no-cost good housekeeping and low capital opportunities. The low-cost opportunities mostly were maintenance items, and the transfer of the budget to the line departments encouraged the line to push for good service from their maintenance providers who, now being free of energy budget responsibilities, were able to concentrate 100% on giving service. So far the high cost projects have not been implemented - they will happen in time.

The programme has succeeded because the problem was reduced to a manageable size before an action plan was drawn up, and because management were not afraid of challenging the norm and making changes.

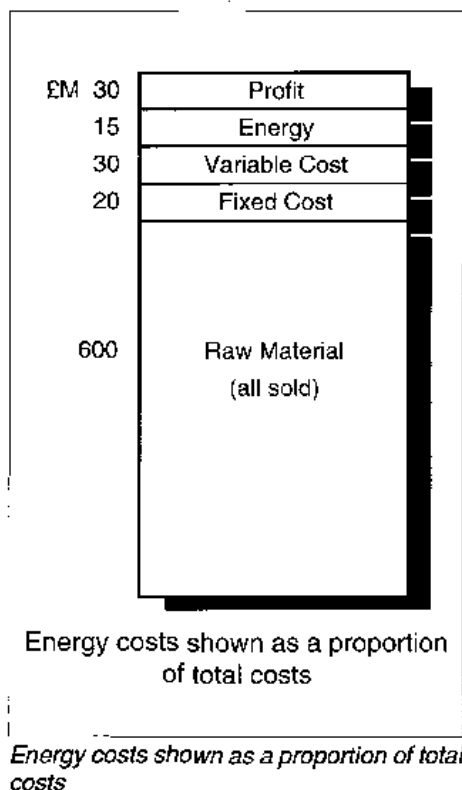


Creative Questions

Asking the right questions can help you to create interest. Example questions are listed below (these originate from Esso Petroleum Company).

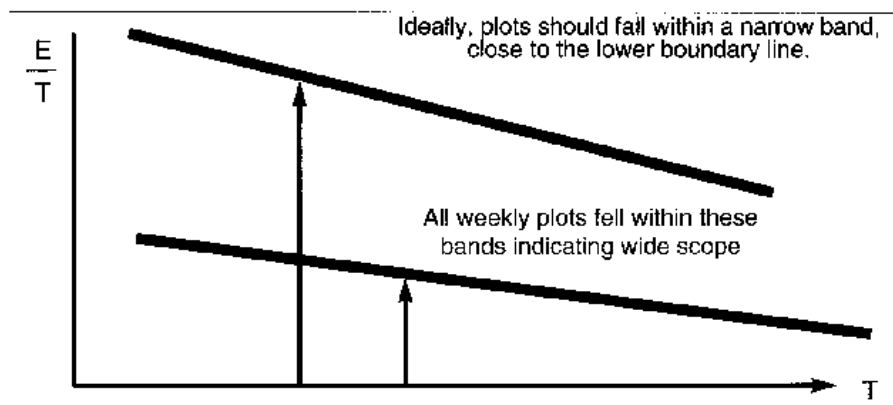
- ? What proportion is energy cost of:
 - turnover;
 - manufacturing costs;
 - profit?
- ? How has that proportion varied over the last three years?
- ? What energy savings have been made in the last year?
- ? What did it cost to make them?
- ? What was saved?
- ? What expenditure is planned for the next five years?
- ? What will the return be?
- ? How have energy costs affected profitability?
- ? Who is accountable for:
 - overall energy saving?
 - efficient utilisation of boilers and furnace plant?
 - efficient use of steam and heat in factory processes?
 - implementing relevant savings ideas?
 - keeping records of energy use?
 - taking action on results from the records?

Significance and Variability



Establishing the true significance of energy in your organisation may be revealing, i.e. discovering what proportion of the direct or controllable cost it represents. In the figure given here, energy only represents 2% of the total cost, but **33%** of the controllable cost. In this case, a 10% reduction in energy will prove equivalent to a 5% increase in profit - equivalent to £40 million of additional sales.

Similarly, identifying the variability in usage is important and useful in establishing what variation exists over the full range of productive levels encountered. In the figure below for an example company, energy usage per tonne of output has been calculated weekly and a year's figures plotted against output. The wide variations in usage, at all levels of production, rapidly convinced the management concerned that significant scope for savings existed.



Energy usage plotted against output

Questions Developed for the Corporate Commitment Campaign

The following questions were developed to create interest in the energy management, and were designed to encourage organisations to make a corporate commitment to save energy. Seeking answers to these same questions should help you take the next step towards your goal of achieving savings.

- ? **HOW DO ENERGY COSTS AFFECT YOUR PROFITABILITY?**
How do they compare with other controllable costs?
What would be the impact on profits of a 10% energy saving?
- ? **HOW COMPREHENSIVE IS YOUR CORPORATE ENERGY POLICY?**
Does it establish standards of performance and your potential for savings?
Does it require an annual Action Plan?
Does it require reports on progress?
When was your policy last reviewed?
- ? **HOW IS YOUR ENERGY MANAGEMENT STRUCTURED?**
Which Board member is ultimately responsible for energy management?
Is ownership for energy formally allocated?
Do you assess performance against targets?
- ? **WHAT RESOURCES HAVE YOU ALLOCATED?**
What have you done to raise awareness among all your staff?
What return on investment do you demand?
Do you invest a specific proportion of your energy costs in improved energy efficiency every year?

Further details on the aims of the Making a Corporate Commitment campaign and how you can join are available from the Department of the Environment on 0171 276 3568 & 0171 276 3741.

The answers to these questions, together with the information set out in this guide, should provide you with an indication of:

- ✓ your organisation's current level of energy efficiency;
- ✓ the actions you should be contemplating;
- ✓ how your energy policy might best be developed and formalised;
- ✓ the additional cash and profit you could generate.

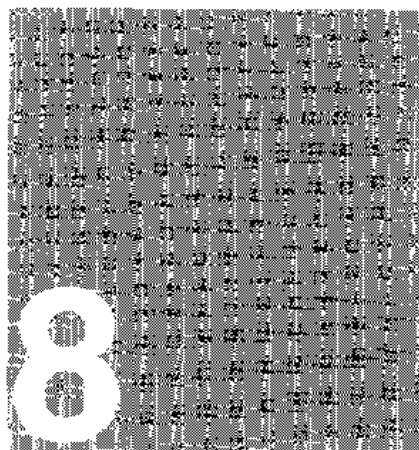
Conclusion

Energy Management Motivation, as set out in this guide, is relatively simple to achieve, enjoyable and highly cost-effective, as seen in the examples given.

If you think energy management is something that does not apply to you, or that it is something for others to worry about, then think again, and remember that there is a direct correlation between good energy management and good management itself.

The introduction and application of good energy management is one of the easiest known ways of enhancing performance in productive industries, and of reducing costs in service industries and functions. The savings made add directly to bottom-line profitability.

Keep energy management simple and don't forget that it is management that is being encouraged and inspired, as opposed to technology. The latter is well already known and highly effective. Motivation and its application are what is needed now to create interest in energy and to encourage savings.



SOURCES OF FURTHER INFORMATION

Department of the Environment Publications

Good Practice Guide 31:	Computer-aided Monitoring and Targeting for Industry
Good Practice Guide 67:	Energy Champions: A Selection of Case Histories
Good Practice Guide 69:	Investment Appraisal for Industrial Energy Efficiency
Good Practice Guide 85:	Energy Management Training
Case Study 214:	Energy Saved by Raising Employees' Awareness
New Practice Final Profile 57:	Using Energy Saving Teams to Motivate Employees in a Food Processing Factory
New Practice Final Report 57:	Motivating Employees through Energy Saving Teams in a Food Processing Factory
Fuel Efficiency Booklet 1:	Energy Audits for Industry Energy Audits for Buildings

Copies of these publications and other literature applicable to energy management are available from:

**Energy Efficiency Enquiries
Bureau
ETSU**
Harwell
Didcot
Oxfordshire
OX11 0RA
Tel: 01235 436747
Fax: 01235 433066
Telex: 83135

**Enquiries Bureau
BRECSU**
Building Research Establishment,
Garston
Watford
WD2 7JR
Tel: 01923 664258
Fax: 01923 664847

Information is also available through your regional Government Office.

Organisations

The following organisations can provide you with help and encouragement to enable you to succeed in motivating your staff to save energy. The list is not exhaustive and has been compiled from data currently available to ETSU. The listing of an organisation does not constitute an endorsement by the Department of the Environment of its competence, and neither does the non-listing of an organisation discriminate against its competence.

Cheriton Technology Management

St Stephen's House
St Stephen's Place
Cambridge CB3 0JE
Tel: 01223 69190
Principal: Dr Peter Harris

Grafton Interaction

9 Cork Street
London W1X 1PD
Tel: 0181 997 3854
Fax: 0181 566 7073
Chief Executive: Andrew Bainbridge

Involvement & Participation Association

42 Colebrooke Road
London N1 8AF
Tel: 0171 354 8040
Fax: 0171 354 8041
Director: Bryan Stevens

MCR Energy

18 Ullswater Road
London SW13 9PJ
Tel: 0181 748 7046
Principal: Michael Roberts

NIFES

King John's Arcade
13 Bridlesmith Gate
Nottingham
NG1 2GR
Tel: 01602 589047
Fax: 01602 589048
Contact: John Mulholland

The John Pooley Consultancy

6 Waterside Close
Hartlebury
Worcestershire
DY11 7TS
Tel: 01229 250585
Principal: John Pooley

Steven Fawkes

Energy Management Consultant
49 Coopers Gate
Southam Road
Banbury
Oxfordshire
OX16 7EQ
Tel/Fax: 01295 273782



Details of other consultants experienced in the provision of training and motivational services can be supplied by:

The Energy System Trade Association (ESTA)
PO Box 16
Stroud
Gloucestershire
GL6 9YB
Tel: 01453 886776
Fax: 01453 885226

The Department of the Environment, Transport and the Regions' Energy Efficiency Best Practice Programme provides impartial, authoritative information on energy efficiency techniques and technologies in industry, transport and buildings. This information is disseminated through publications, videos and software, together with seminars, workshops and other events. Publications within the Best Practice Programme are shown opposite.

Further information

For buildings-related topics please contact:
Enquiries Bureau

BRECSU

Building Research Establishment
Garston, Watford, WD2 7JR
Tel 01923 664258
Fax 01923 664787
E-mail brecsu@bre.co.uk

For industrial and transport topics please contact:
Energy Efficiency Enquiries Bureau

ETSU

Harwell, Didcot,
Oxfordshire, OX11 0RA
Tel 01235 436747
Fax 01235 433066
E-mail etsu@eeb.co.uk

Energy Consumption Guides: compare energy use in specific processes, operations, plant and building types.

Good Practice: promotes proven energy efficient techniques through Guides and Case Studies.

New Practice: monitors first commercial applications of new energy efficiency measures.

Future Practice: reports on joint R&D ventures into new energy efficiency measures.

General Information: describes concepts and approaches yet to be fully established as good practice.

Fuel Efficiency Booklets: give detailed information on specific technologies and techniques.

Energy Efficiency in Buildings: helps new energy managers understand the use and costs of heating, lighting etc.